Simulations of RFOFO Ring Emittance Exchange

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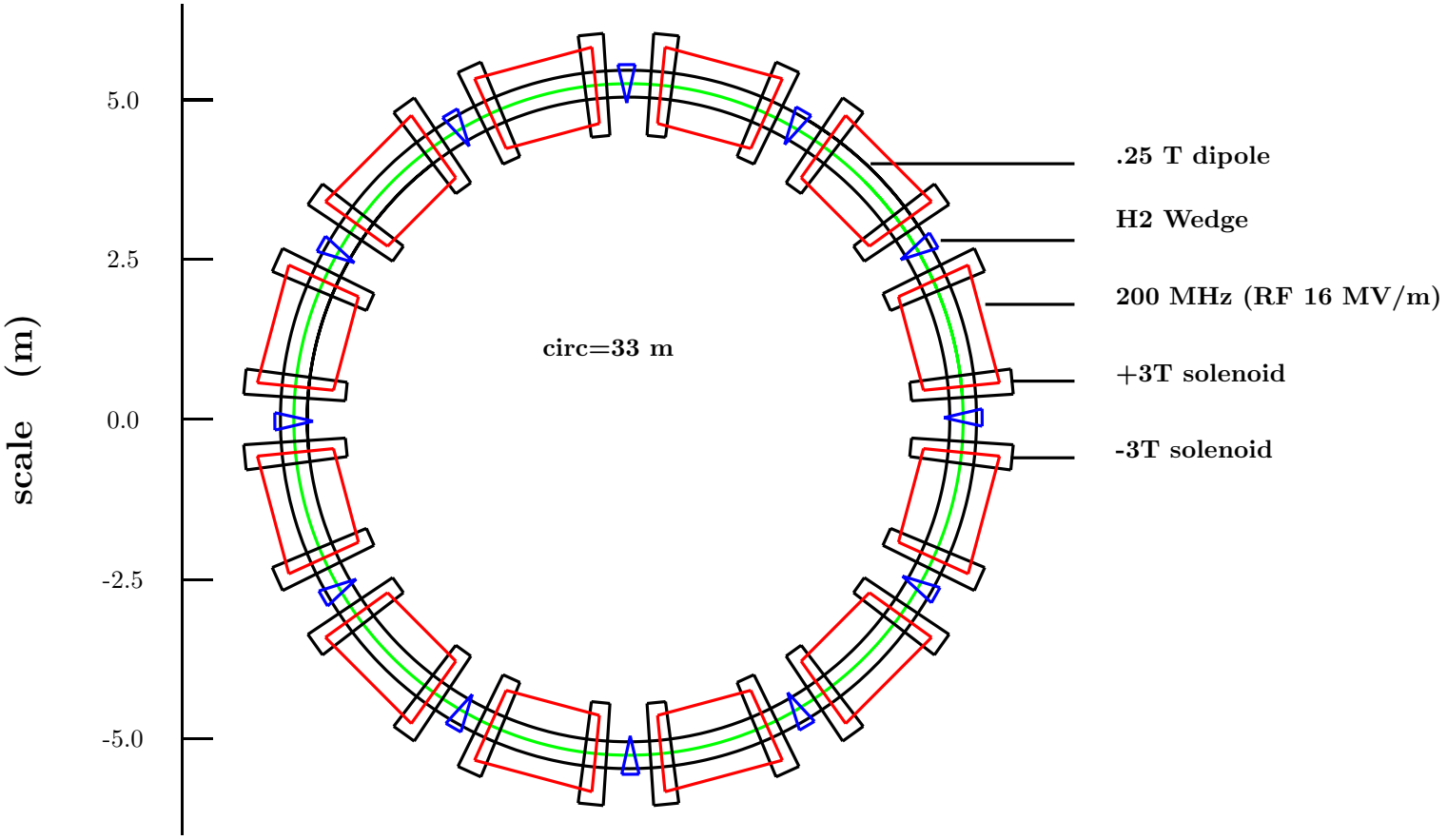
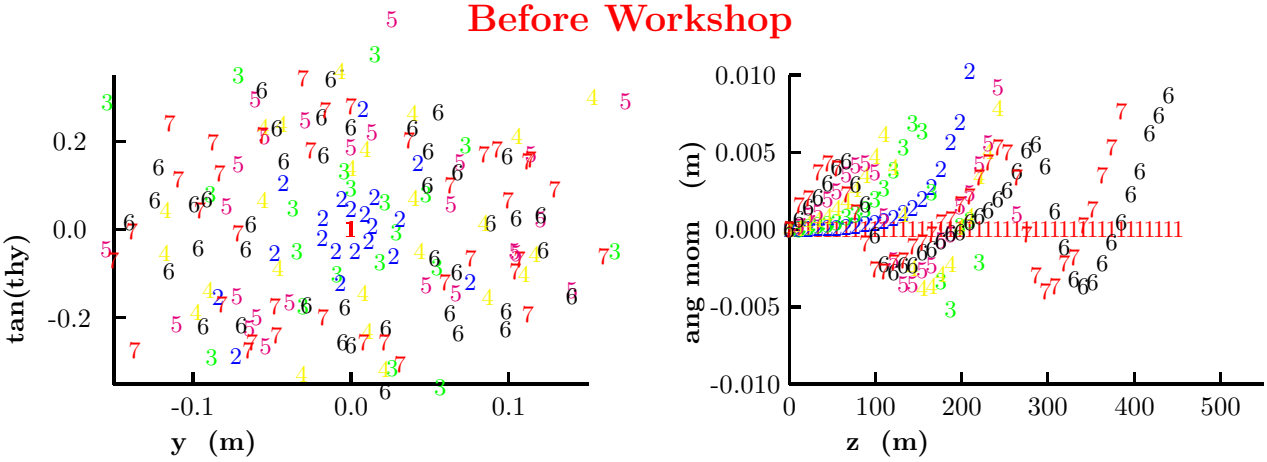


An upward spiral would solve injection/extraction problems and allow tappering of beta function to give continuous cooling

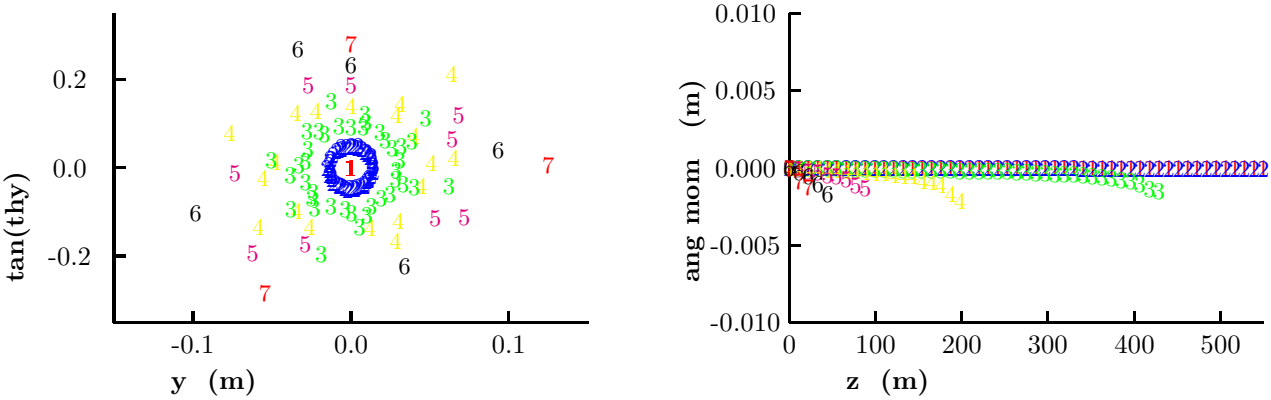
Improvements in tracking in ICOOL

RFOFO Lattice. No Bending, but 3rd order method allowing bends. Track single particles through 200 cells

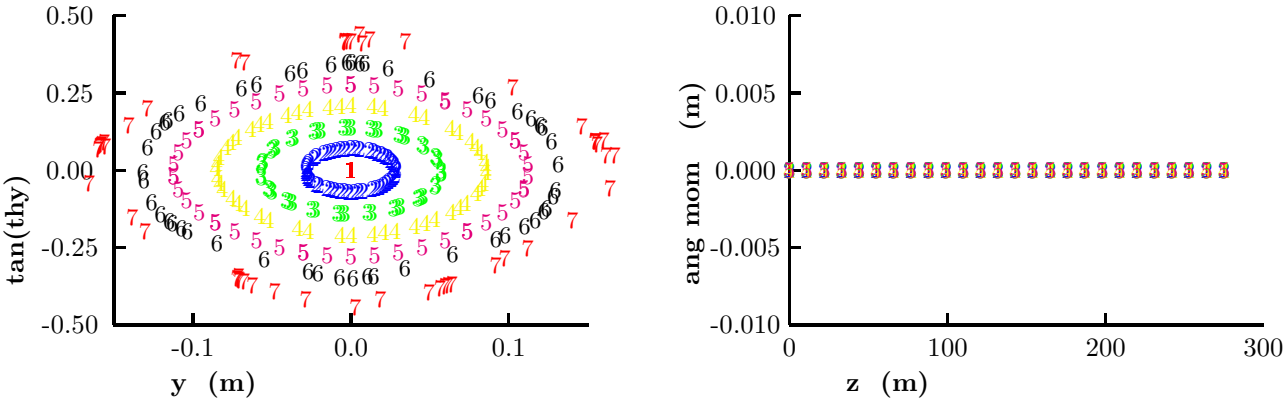
Before Workshop



Interpolation Fixed

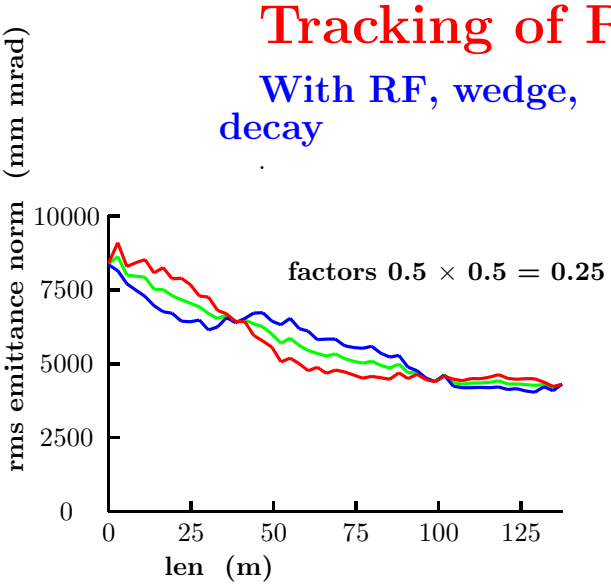


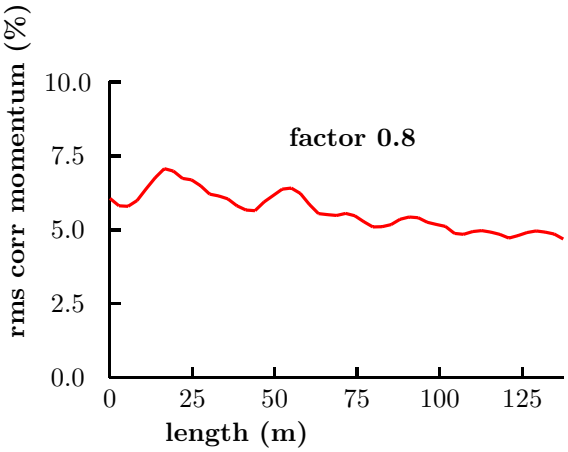
Fourier Definition of fields

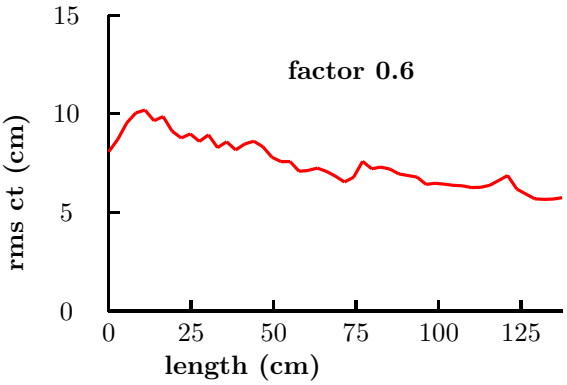


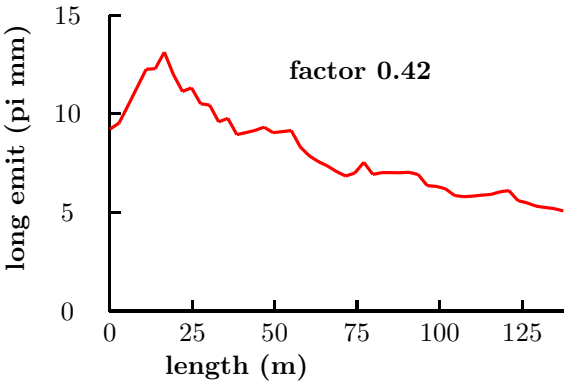
Tracking of Ring from Gaussian

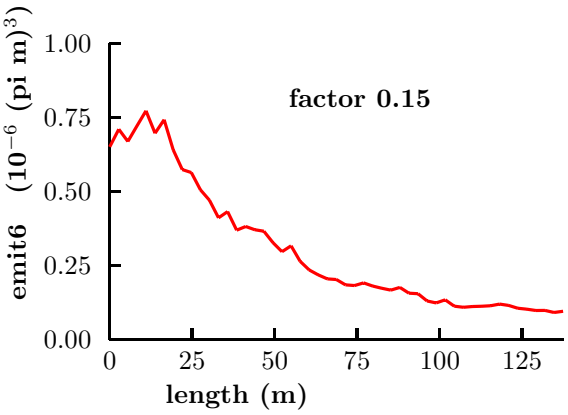
With RF, wedge, scatter and straggle, but no decay

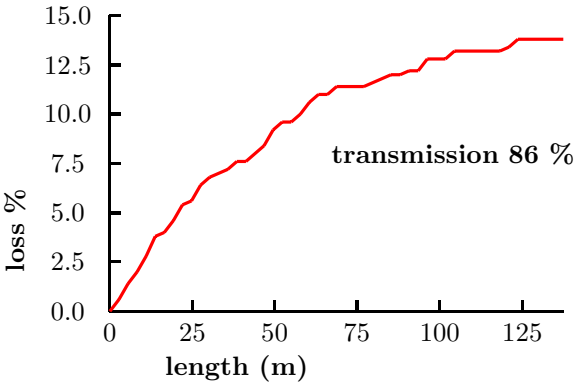












Summary

- Longitudinal emittance $\times$ 0.42
- Transverse xy emittance $\times$ $(.5)^2 = 0.25$
- 6D emittance $\times$ 0.15
- Transmission 86 %
- Quality Factor ($\epsilon_{in}/\epsilon_{out} \times$ Trans $=$ 5.7

Conclusions

- There have been problems in tracking solenoid channels with bends in ICOOL, and several of them have been fixed;
  - Interpolation of tables of axial fields
  - Adding a missing term in the third order expansion
  - Allowing axial fields to be specified by Fourier components, thus elliminating discontinuities between cell fields.
- But the derivation of off axis fields is still limited to only 3rd order in radius (7th order is used in systems without bends), and this may still be causing difficulties.
- Using these third order calculations, 6D emittance cooling was achieved:
- Requires optimization, but should significantly improve study 2 performance.
- This, and the bend solenoid simulations, are the only emittance exchange demonstations with tracking in full Maxwellian focus and RF fields.